

Fig 1
Top Level Overview
of General Process

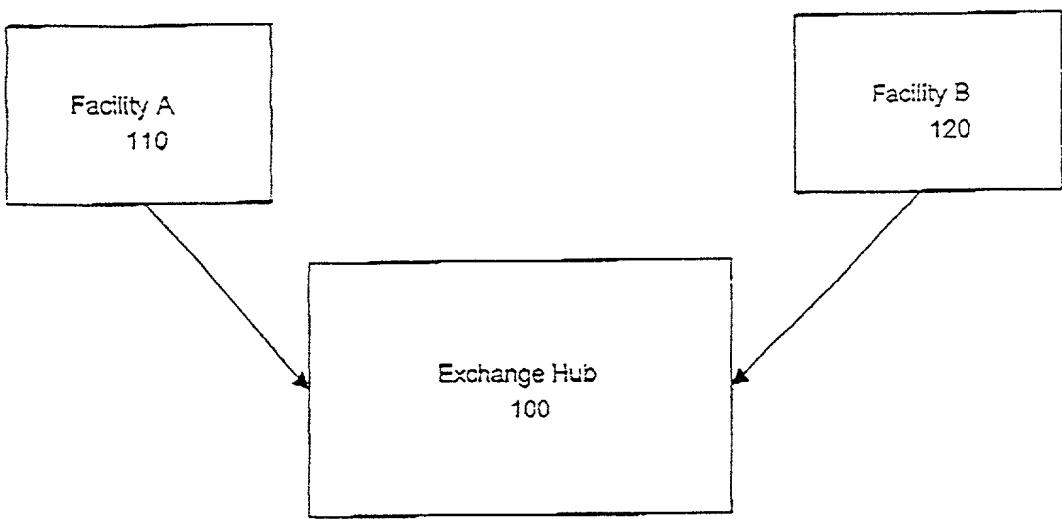
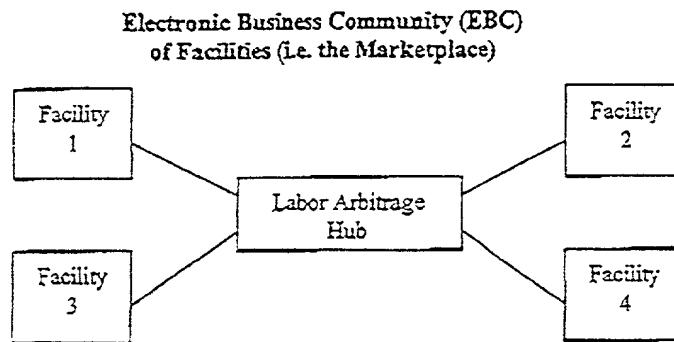


Fig. 2

EBC Example

Figure 3: Labor Arbitrage Electronic Business Community. *An Intelligent Marketplace*



NOTE: Multiple, separate, or overlapping EBC's exist at intellicost.com For example, in healthcare, EBC must be in same geographic region

Figure 4: Labor Arbitrage Electronic Business Community.

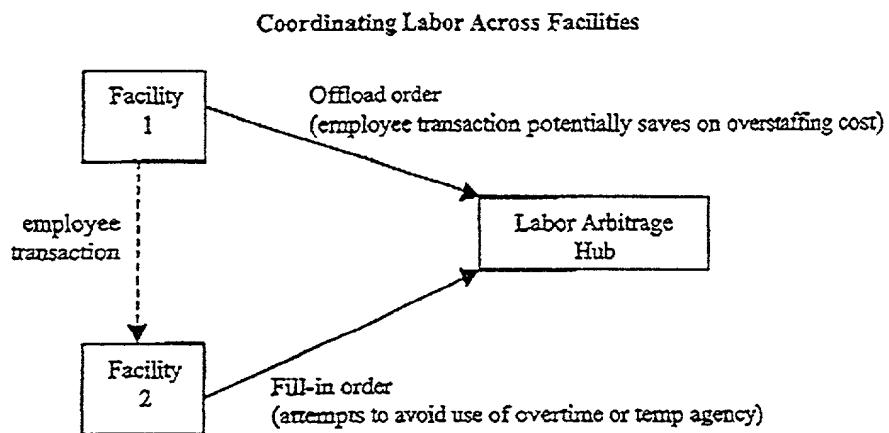
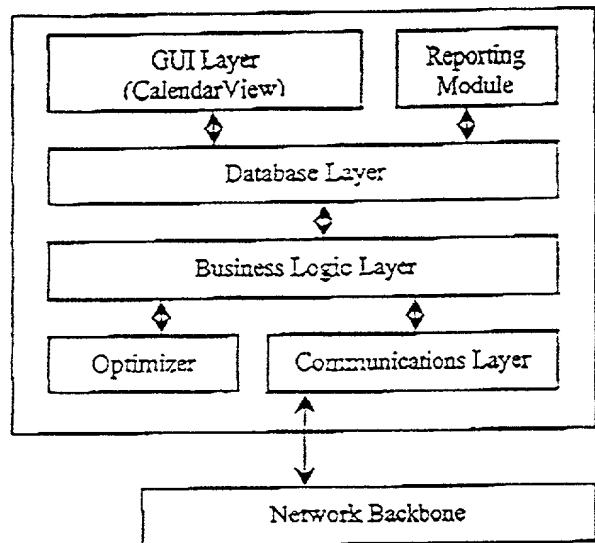


Figure 5: Client Process Layers



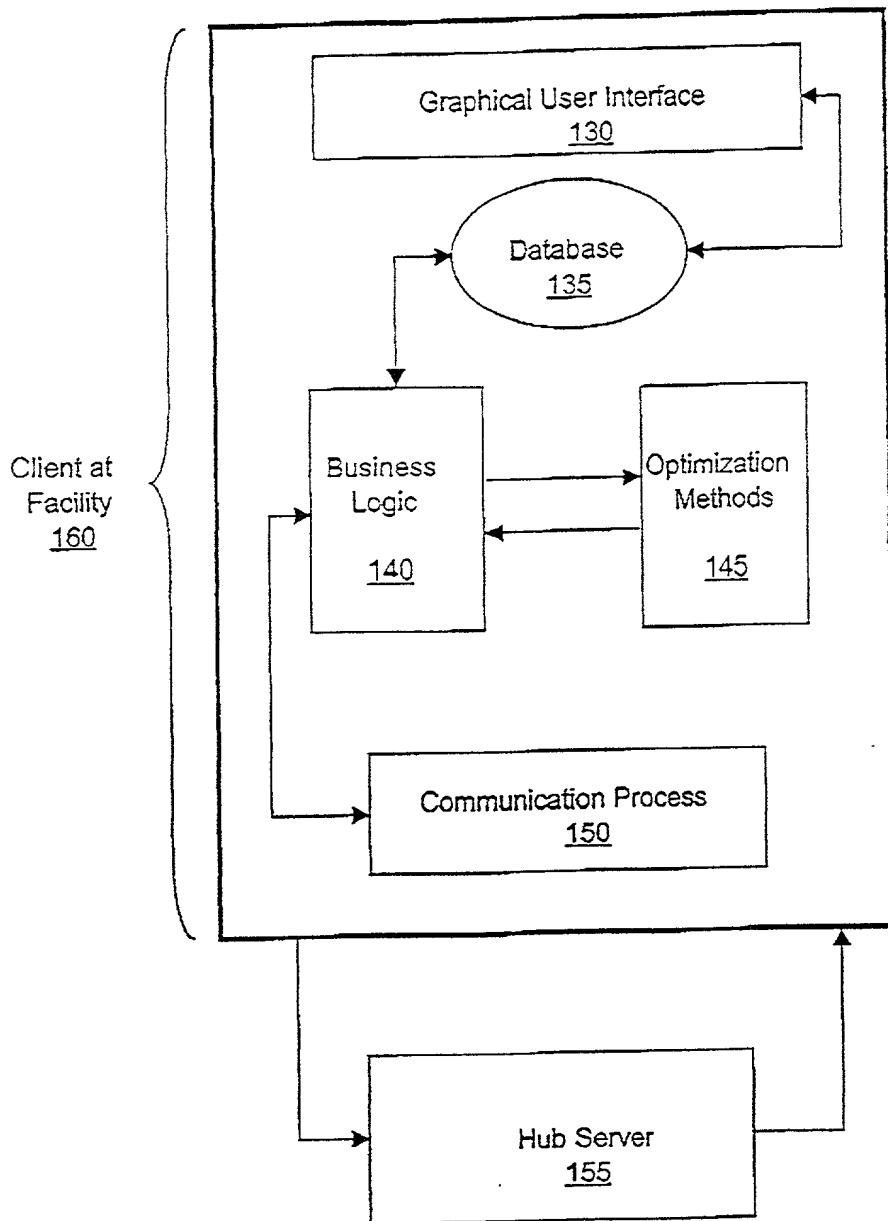


Fig. 6
Client Process at Facility

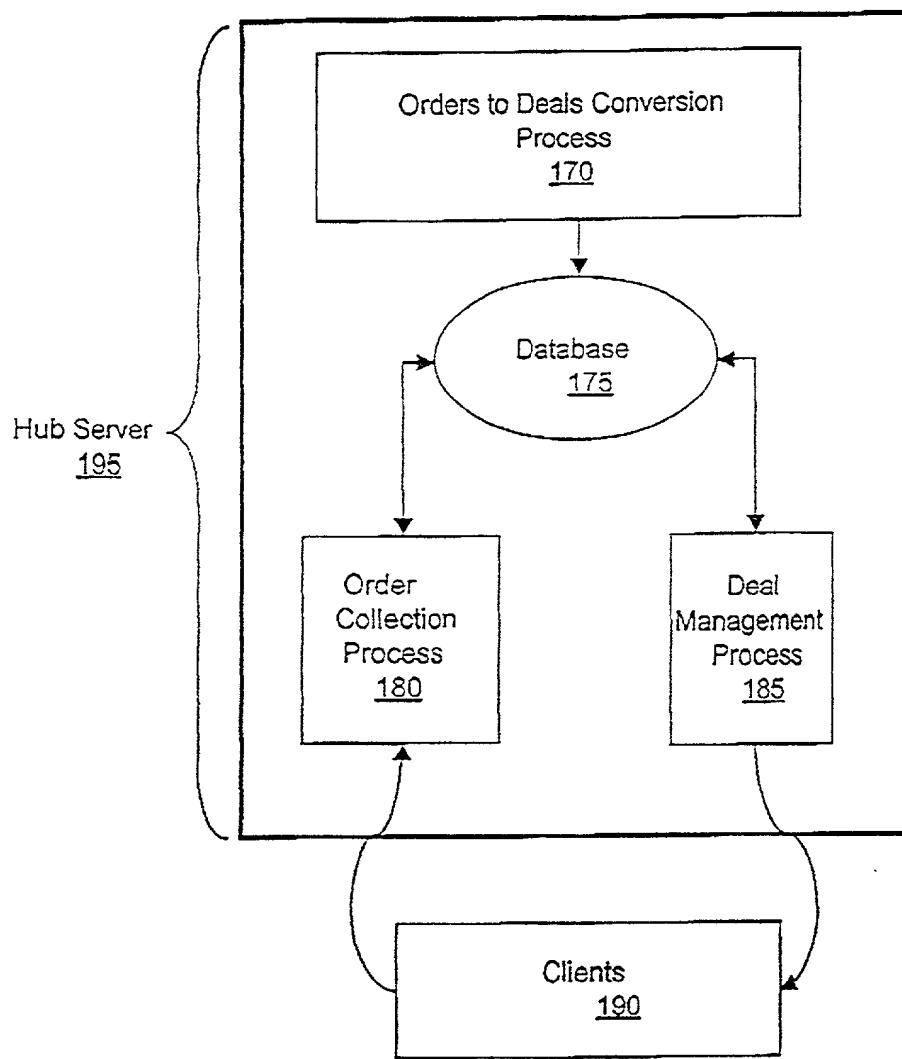
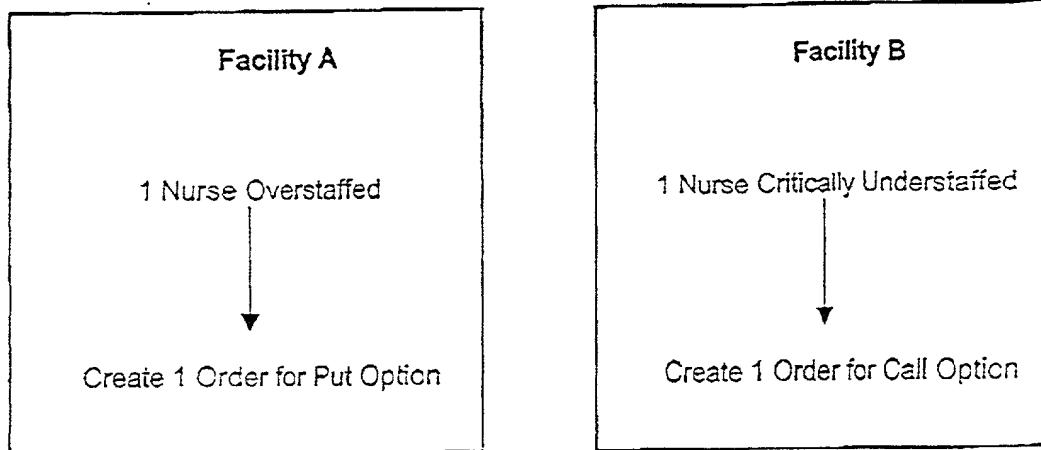


Fig. 7
Server Process at
Hub

<p>10 Patient Bed Facility</p> <p>Needs 2 Nurses to Deliver Quality Care</p> <p>Has 3 Nurses Scheduled for Shift</p> <p> </p> <p>1 Nurse Overstaffed</p>	<p>15 Patient Bed Facility</p> <p>Needs 3 Nurses to Deliver Quality Care; but requires at least 2 Nurses to Deliver Proper Care</p> <p>Has 1 Nurse</p> <p> </p> <p>1 Nurse Understaffed, requiring overtime or temp agency</p>
<p>Facility A</p> <p><u>200</u></p>	<p>Facility B</p> <p><u>210</u></p>

Fig. 8
Staffing Situation at
Example Facilities



300

310

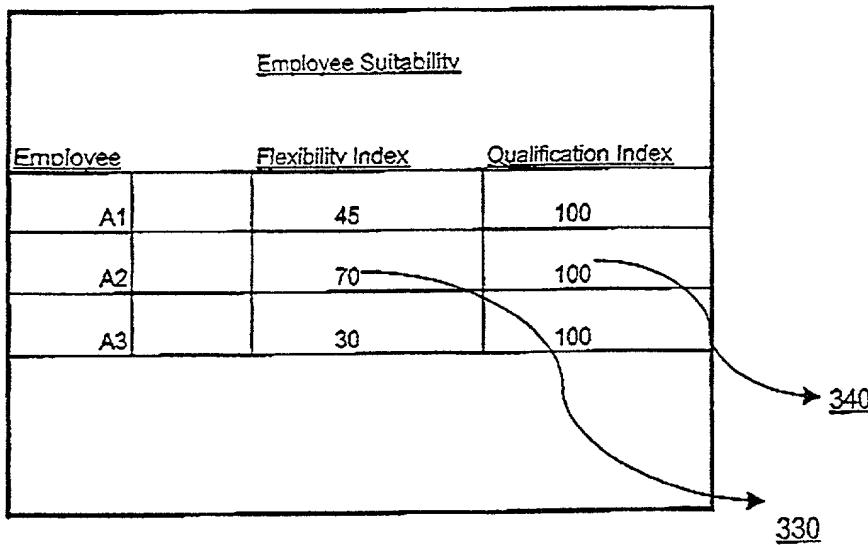


Fig. 9
Determining Need for,
and Creating, Option
Orders

Figure 10: Options Order Valuation

Facility A

1 overstaffed shift excess cost
simple illustration

$$8 \text{ hours} * \$20/\text{hour} = \$160$$

Put option value = \$160

Facility B

1 understaffed to critical shift excess
cost, simple illustration

($8 \text{ hours} * \$20/\text{hr} = \160 for regular,
in house employee)

However, $8 \text{ hours} * \$40/\text{hr} = \320
for typical agency employee

Figure 11: Internal Transaction Valuation and Selection
(employing change management to minimize disruption, which is critical to exchange valuation)

Weekly Labor Resource Configuration Cells

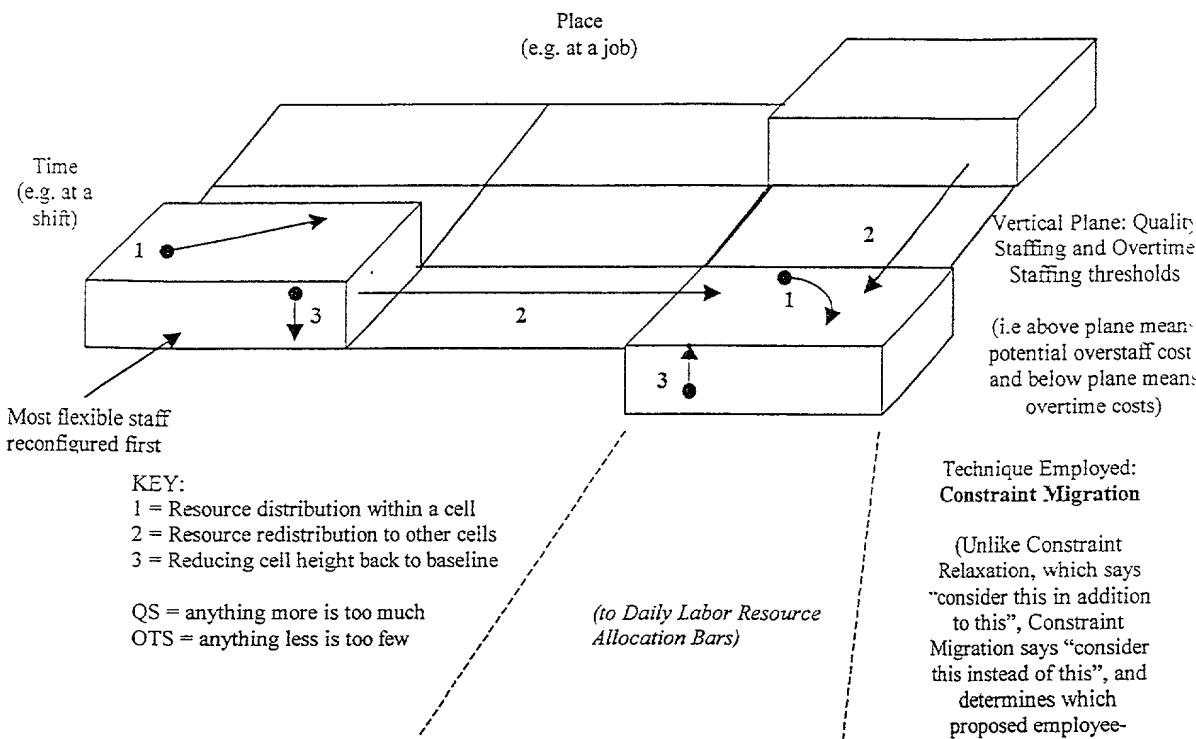
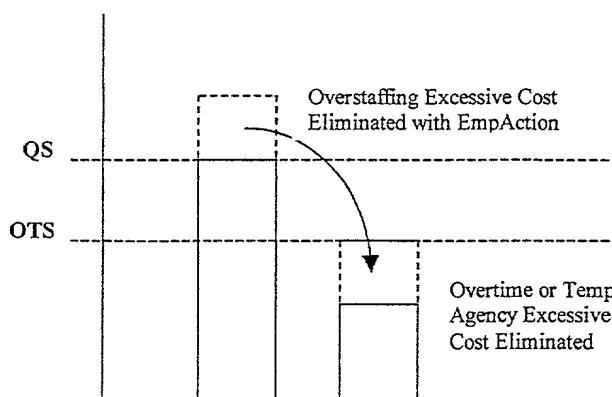


Figure 12 : Intellicost Transaction Valuation and Selection.

Daily Labor Resource Allocation Bars (Within a Configuration Cell)



NOTES:

- Determine the highest return (savings and least risk (i.e. employee backlash EmpAction using expected values of return/risk table
- Higher return/risk levels can be achieved depending on model chosen
- Risk based on factors such as employee cooperativeness and replaceability

Figure 13: Determining Desired Strike Price Range of Option Order

Facility A

Policy:

Call:

Purchasing range for nurse staff for call option order
\$100 - \$200

Put:

Subsidy range for option order
\$0 - \$50

or

Use a % of normal cost range

Call: 62% - 120%

Put: 0% - 30%

or

Facility A wants to pay only \$0 - \$50 for this shift, so facility wants recipient to pay for this shift

\$110 - \$160

Facility B

Call:

\$120 - \$175

Put:

\$10 - \$60

or

Use a % of normal cost range

75% - 109%

6% - 37.5%

or

Facility B wants to pay \$120-\$175 for this shift so a subsidy (of normal price) of

\$15 - \$40

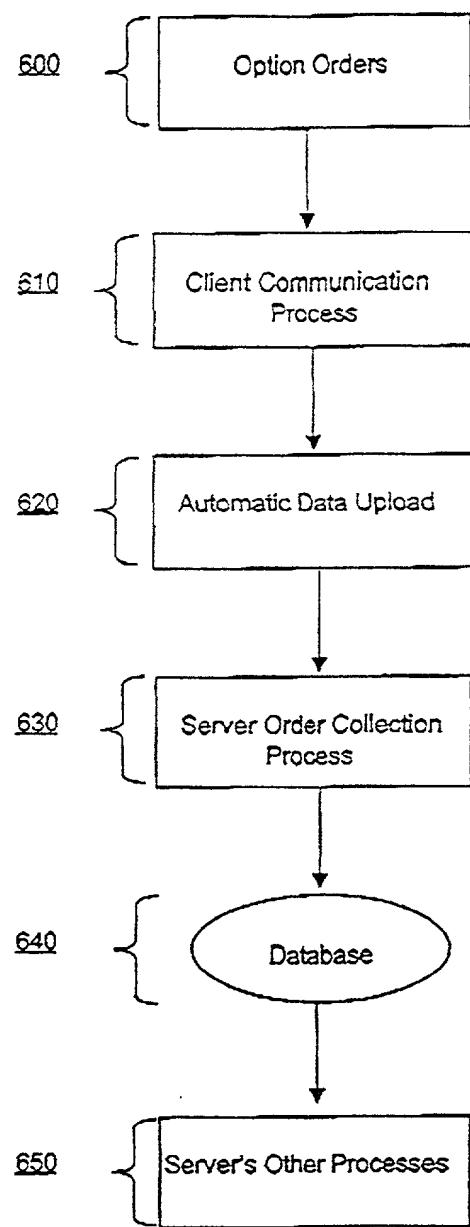


Fig. 14
Delivering Option
Order to
Exchange Hub

700

From Facility	To Facility		
	A	B	C
A	0	\$320	\$220
B	0	0	0
C	0	\$40	0

710

720

730

740

Fig. 15
Option Orders
Matching for Potential
Deals

From Facility	To Facility		
	A	B	C
A	0	\$320	\$220
B	0	0	0
C	0	\$40	0

Facility A: 95 % chance of overstaffing * \$160 for OS = \$152
 $\$152 - \$50 \text{ subsidy} = \$102 \text{ ROI vs } \160

Facility A Expected Value Ranges:

Lower Bound Expected Value:

Facility B: 75% chance of agency usage * \$160 for OT = \$12
 $\$120 - \$15 \text{ subsidy} = \$105 \text{ ROI vs } \160

[Probability of savings * savings from costs avoided or added earnings] - highest deal subsidy cost

Upper Bound Expected Value:

[100% * Highest savings] - lowest subsidy] i.e. return minus investment

repeat for facility B

whichever facility's combined expected value is higher becomes bidder,
 regardless of whether they will be the donor or recipient of employee transfer,
 while lower becomes asker.

Fig. 16
 Bidder vs. Asker Determination
 in Option Deal Negotiation

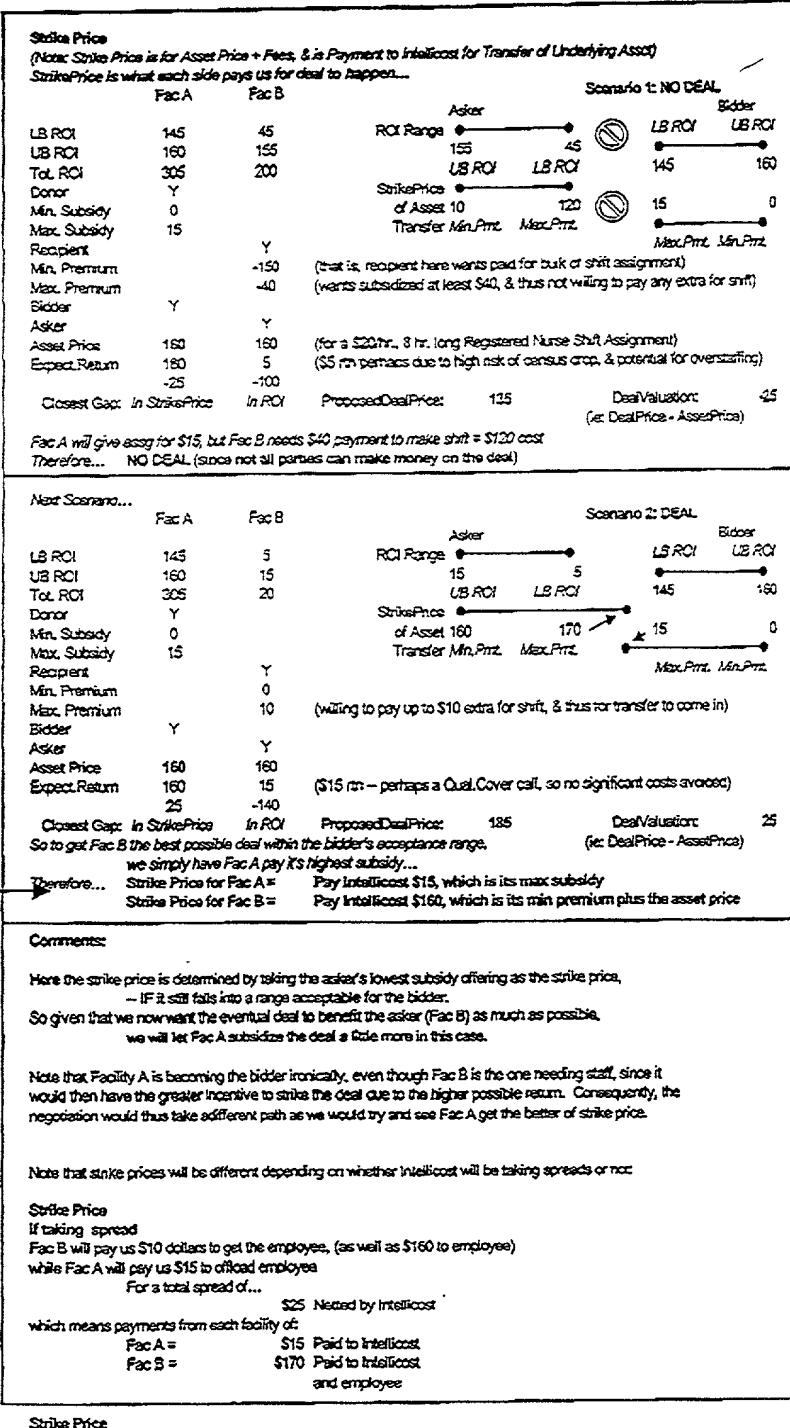


Fig. 17
 Determining Final Strike Price
 for Option Deal

1000

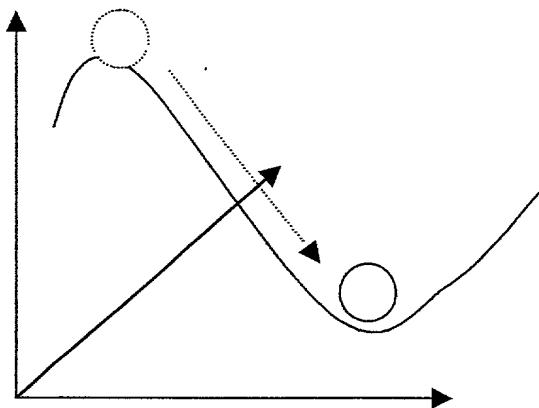
From Facility	To Facility		
	A	B	C
A	0	\$320	\$220
B	0	0	0
C	0	\$40	0

1010 1020 1030

Fig. 18
Determining and Prioritizing which Option
Deals to Accept to Members of the EBC,
and When to Do So

Figure 19: Optimization via Gradient Descent
(here showing how the technique canvasses a cost terrain)

This optimization technique (also known as “hill climbing”) can be used to find an optimal or oftentimes, at least, a near-optimal solution for a variety of transactions, whether it be assignments, employee-actions, or deals.



**3-D Cost Terrain Problem-Solving
Using Gradient Descent**
(here finding a local minimum)

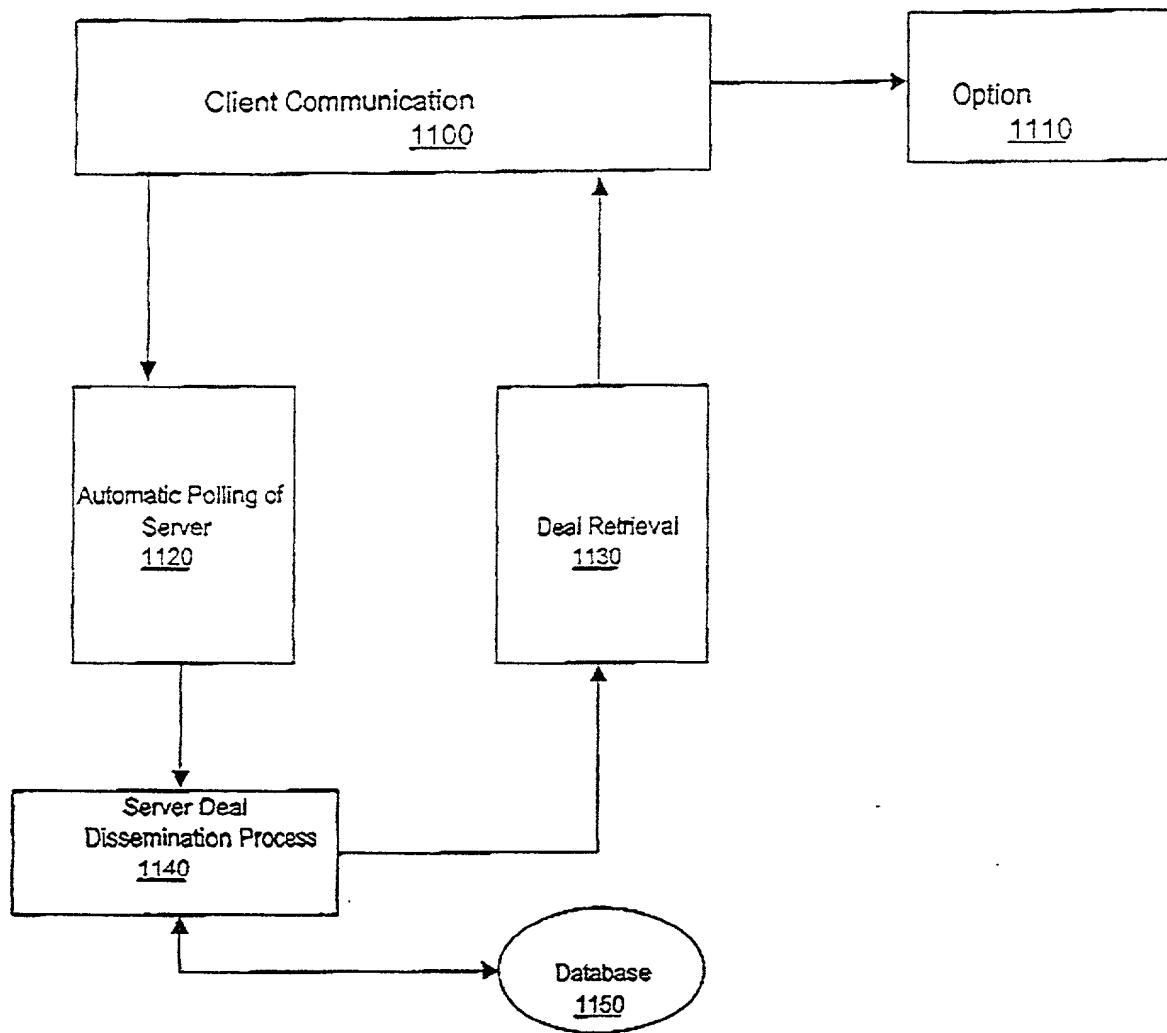


Fig. 20
Delivering Option Tentative Contract
from Exchange Hub Back to Clients at
Facility

10020185 - 022222

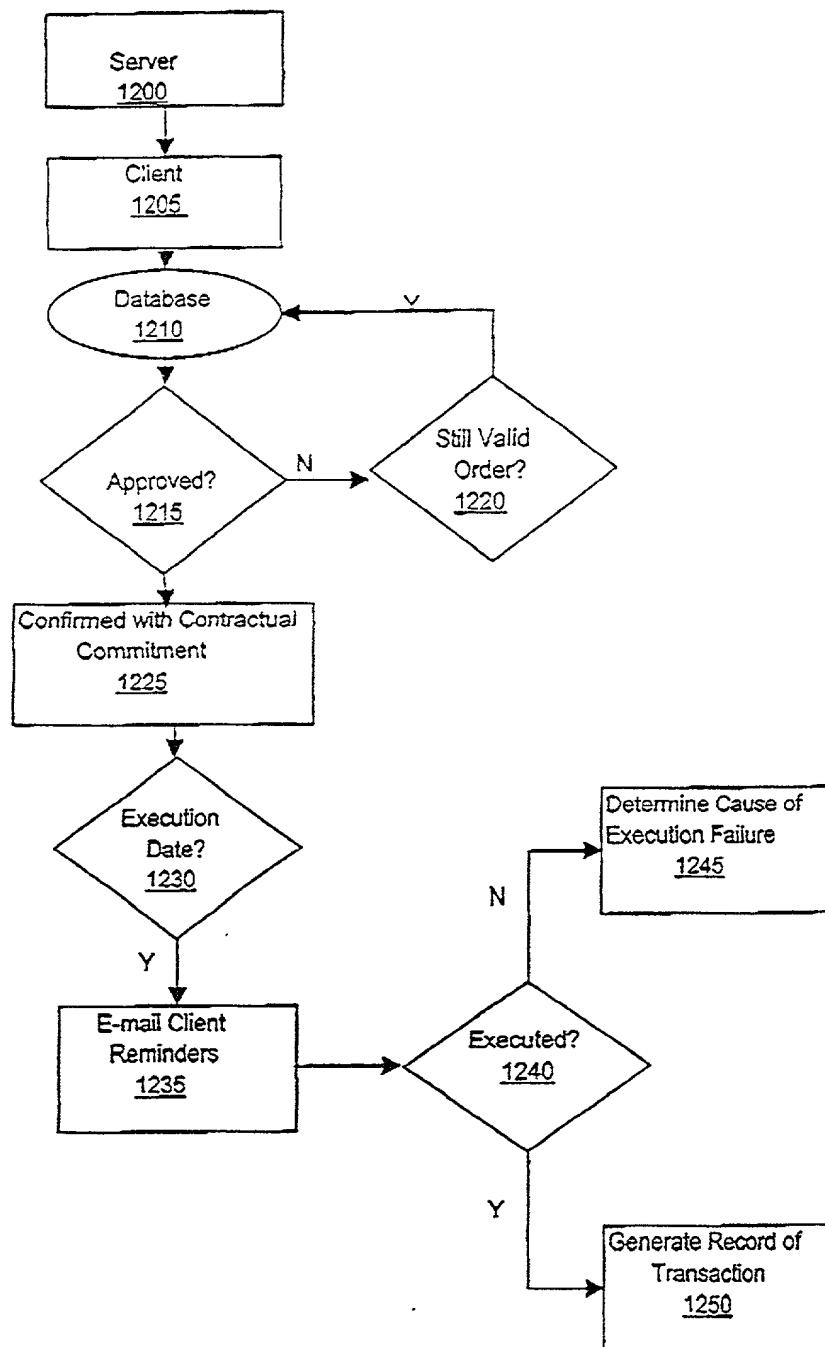


Fig. 21
Tentative Option
Contract Execution

Figure 22

Labor Arbitrage Process as the Facility Sees It

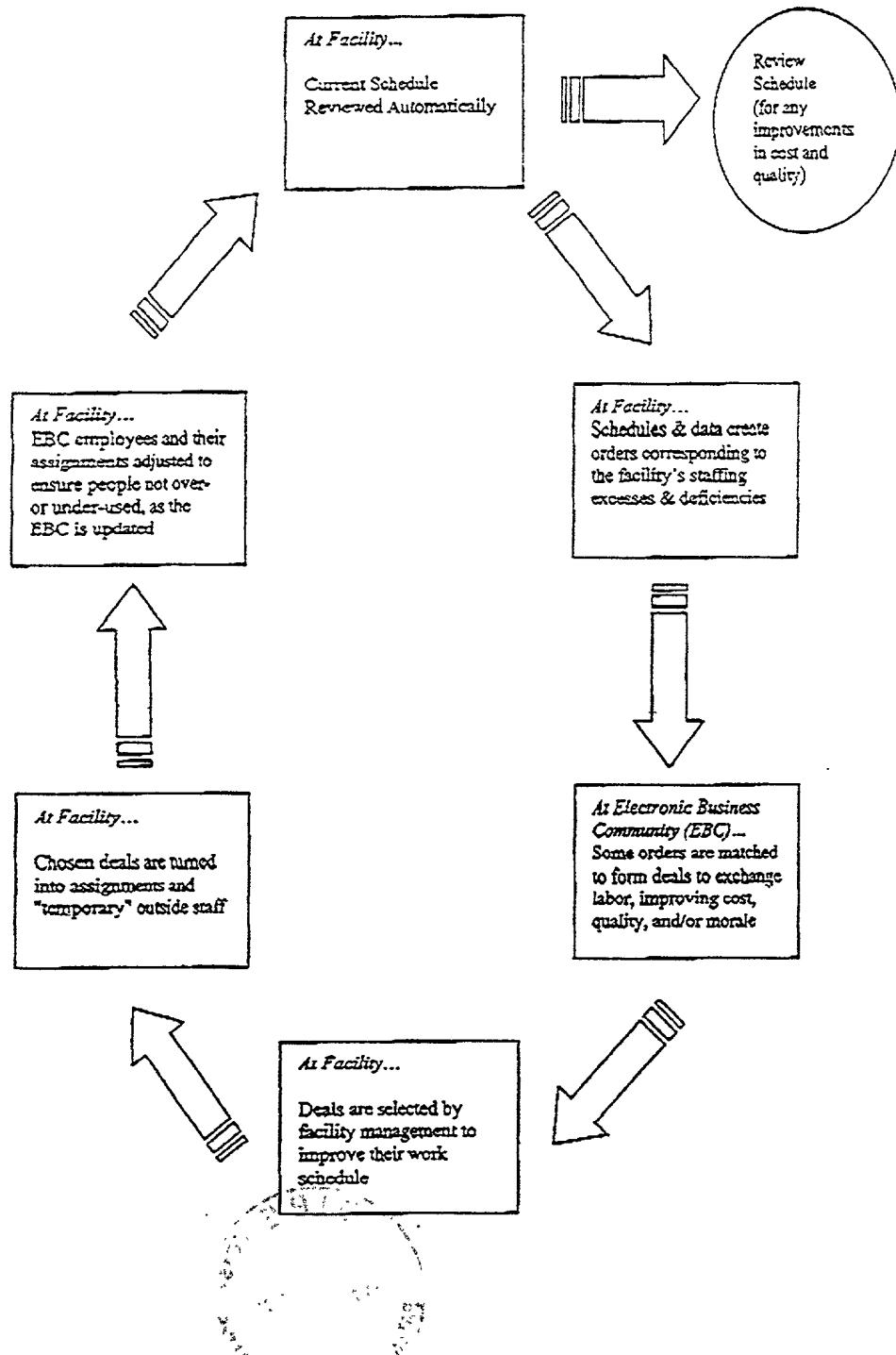


Figure 23
Process Categories Overview

How Client-User interactions fit into process categories already covered, namely Client-Server and Server Arbitrage areas.

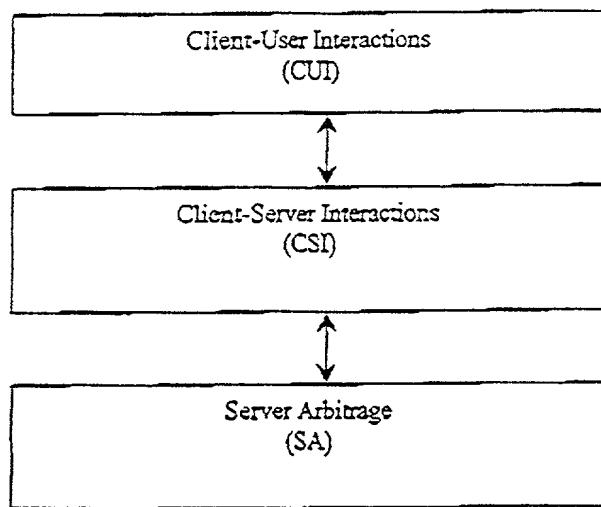
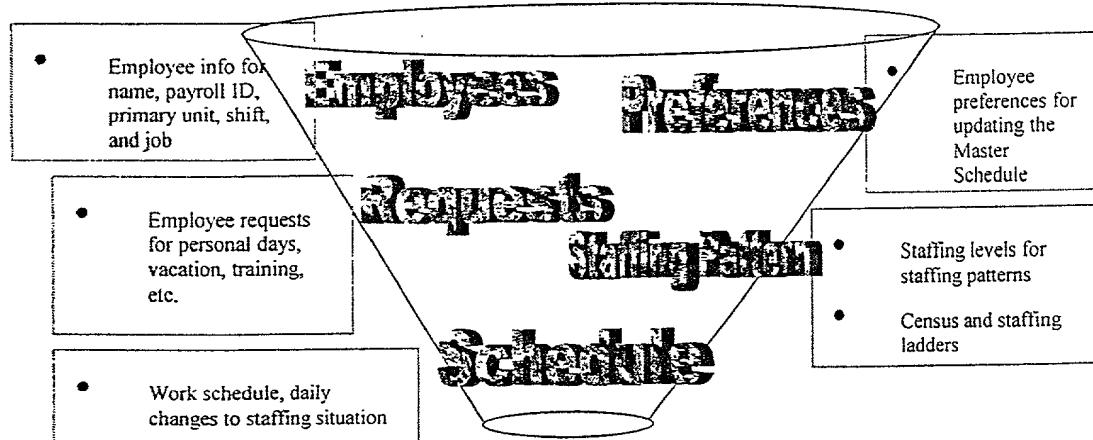


Figure 24

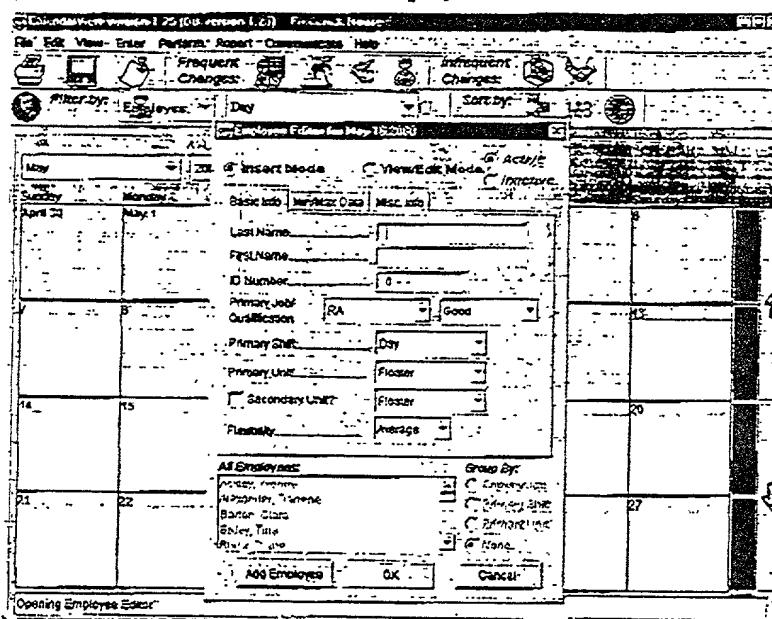
Interfaces used in Client-User Interactions (CUI) Component

"Data Funnel" Overview of General Types of Data required to enable EBC Arbitrage.



- Employees (ES) – this represents the data collected by the Employee Information Editor screen.
- Preferences (PS) – this represents the data collected by the Rotating Schedule and Preferences Editor screen.
- Requests (RS) – this represents the data collected by the Requests Editor screen.
- Staffing Pattern (SS) – this represents the data collected by the Staffing Levels Editor screen.
- Schedule (SC) – this represents the data collected and edited by the CalendarView screen and Assignment Editor screen.

Figure 25
Sample screen to enter and maintain employee information.



Objective of the Screen:

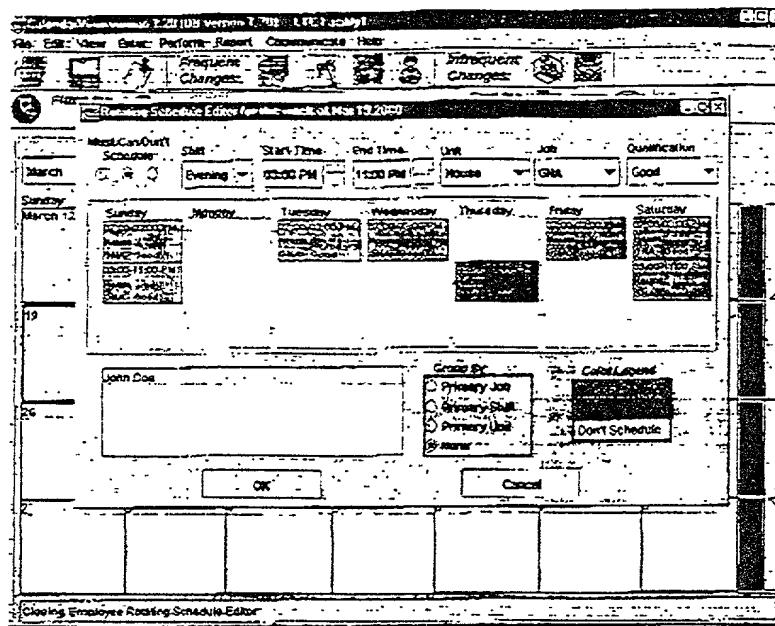
- To capture the data relating to the labor supply elements, which are the employees that can be utilized to staff a particular staffing need.

Descriptions of Essential Fields Used by Arbitrage Process: (Screen Code CULES.)

1. Last Name and First Name – to indicate easily to the facility which employee is involved.
2. ID-Number – this is a “globally unique” identifier for the employee throughout the entire potential scope of the EBC. Usually involves appending an employee’s local payroll number to the globally unique facility ID. However, it could simply be the employee’s Social Security Number.
3. Primary Job – this is the primary job that the employee is qualified to work, such as Registered Nurse, Nursing Assistant, etc.
4. Primary Shift – this is preferred shift that the employee expects to work.
5. Primary Unit – this is the floor, wing, or other unit where the employee is asked to focus their time in order to offer the patients more “continuity of care” (i.e. customized attention).
6. Flexibility – this is the simple default flexibility of the employee as initially assessed by the Staffing Coordinator. More complex formulas derive flexibility at later stages.
7. Minimum Shifts Per Week – this is the minimum shifts expected by the employee (usually 5 per week is expected by a Full-Time Employee, or FTE).
8. Minimum Hours Per Week – minimum hours expected by the employee.
9. Maximum Shifts Per Week – maximum expected or allowed for the employee.
10. Maximum Hours Per Week – maximum expected or allowed for the employee.
11. Active Date – this is the first date that an employee can be utilized in staffing.
12. Inactive Date – this is the last day that an employee can be utilized in staffing.

Figure 26

Sample screen to enter and maintain the "Master Schedule" and Availability of each Employee.



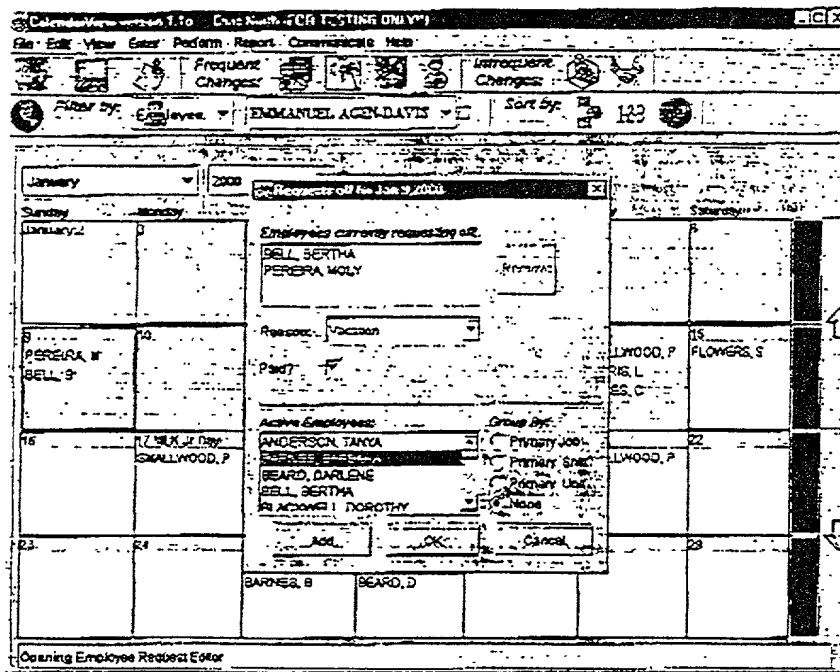
Objective of the Screen:

- To capture the data relating to the employees' normal permanent availability or mandatory scheduling constraints that should be used when evaluating their "fit" for a particular assignment.

Descriptions of Essential Fields Used by Arbitrage Process: (Screen Code CULPS.)

1. Start Date of Preferences' Week – this tells the system to which time-frame these preferences apply to this employee.
2. Name – this is the name of the employee to which the preferences apply.
3. Must Schedule – this indicates that this preference is a mandatory assignment, whether the employee is needed or not.
4. Can Schedule – this indicates that the employee has stated that they are available to work, and thus represents a possible assignment if the employee is needed.
5. Don't Schedule – this is to indicate that the employee has said they cannot work this day, time, shift, etc.
6. Shift – this is to indicate the time-period for the day the employee can work. There are 3 standard shifts usually seen in healthcare: Day (normally 7am-3pm), Evening (normally 3pm-11pm), and Night (normally 11pm-7am).
7. Start-Time – this is used if the time for this preference is not a standard Day/Evening/Night time period mentioned above.
8. End-Time – same as above.
9. Unit – this is if the employee is expected to or expecting to work a different unit from the one they should normally be scheduled at.
10. Job – this is for noting the job qualification of the employee for this particular preference, if different from their primary job type they are expected to work.

Figure 27
Sample screen to enter and maintain employee requests for time-off.



Objective of the Screen:

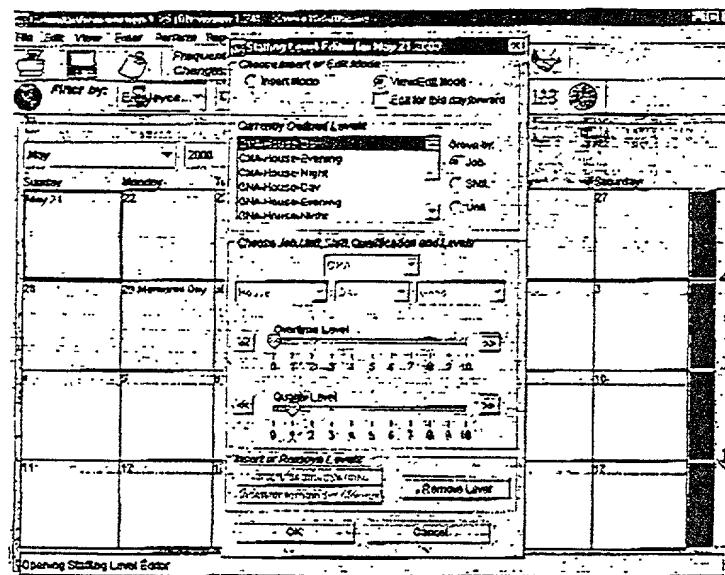
- To capture the data relating to the employees' temporary availability constraints.

Descriptions of Essential Fields Used by Arbitrage Process: (Screen Code CULRS.)

- Date – the date of the request for time off.
- Name – the employee's name that is requesting off.
- Reason – the reason that the employee has given for their needing to schedule a day off.

Figure 28

Sample screen to enter and maintain staffing levels needed per job, unit, and shift, including the desired quality level as well as absolute minimum level.



Objective of the Screen:

- To capture the data relating to the labor demand elements, which are the slots required to staff a particular staffing need.

Descriptions of Essential Fields Used by Arbitrage Process: (Screen Code CULSS.)

1. Date of Level – this is the date of when a particular need is in effect.
2. Defined Level Name – this defined name is essentially the time-place attributes of the staffing need, such as job-unit-shift-for-this-day.
3. Job – this is the job qualification required for this particular staffing need.
4. Unit – this is the unit to which this particular staffing need applies.
5. Shift – this is the time-period of the day to which this particular staffing need applies.
6. Overtime Level – this is the staffing level that the facility feels is necessary to deliver the absolute minimum level of service and care to their patients/residents. Anything less than this level is considered requiring of staffing by any means possible, including Agency or overtime, and is thus likely going to involve excess cost (i.e. cost is more than the standard shift of an in-house employee).
7. Quality Level Level – this is the staffing level that the facility feels is necessary to deliver quality service and care to their patients/residents. Anything more than this level is considered to be an excess cost from overstaffing.

NOTE:

There is also a standard Facility Data Screen to capture the following types of information, among others:

1. Facility Name, address, & zip code
2. The facility's job types, shift time periods, and unit names.
3. The various wage rates for the different jobs, including a entry level wage or average wage rate
4. The various budget data, some through configuration files

Figure 29

Sample screens showing various descriptions of a Work Schedule.

The figure consists of three separate windows of a software application, likely Oracle, displaying work schedules. Each window has a title bar with the application name and version (e.g., "C:\CalendarView version 1.1v (DB version 1.0H) - Oakcrest").

- Top Left Window:** Shows a grid for "February" with rows for "Employee" and "Assignment". The employee listed is "Patrice Adams". The grid displays various shifts and assignments for her throughout the month.
- Top Right Window:** Shows a similar grid for "February" for the same employee, "Patrice Adams". This view appears to be a more detailed or specific subset of the data shown in the first window.
- Bottom Window:** Shows a grid for "January" with rows for "Employee" and "Assignment". The employee listed is "TANYA ANDERSON". The grid displays various shifts and assignments for her throughout the month.

All three windows include standard menu bars (File, Edit, View, Enter, Perform, Report, Communicate, Help) and toolbars with icons for frequent changes, infrequent changes, filter by, sort by, and other functions.

Objectives of the Screen:

- To display the current work schedule that is used to determine the current staffing situation, as well as capture the data relating to the changes in that situation.

Descriptions of Key Components Used by Arbitrage Process: (Screen Code CUI.SC.)

- Day Cell – shows the day of the work schedule, and holds as its contents the assignments for that day.
- Date of Cell – shows the date of the cell.
- Assignment of Employee – the contents of a day cell are known as an assignment – which is a person working at job on a unit on a specific day for a specific shift time period.
- Assignment Job – this is the job that the employee will hold during this particular assignment.
- Assignment Shift – this is the shift time period for the assignment.
- Assignment Unit – this is the job that the employee will hold during this particular assignment.
- Assignment Start Time – if the shift is not for a standard Day/Evening/Night time-frame, this holds the non-standard starting time.
- Assignment End Time – if the shift is not for a standard Day/Evening/Night time-frame, this holds the non-standard ending time.

Fig. 30
Intermediate & Text Files Used in Process

Ref.# 5001: One type of Orders file

```
# Type Facility Worker Window wk/dy/sh/jb/un/qu/$$/nego  
  
### 1 S F R C - Fac1:MARIA.DOE 0 0 1 1 0 0 0 MARIA.DOE 2 6 202 Sun  
Dec 19 00:00:00 PST 1999 Sun Dec 26 00:00:00 PST 1999 0 0 0 0 0 0 64.0  
0.0 64.0  
### 2 S F R C - Fac1:ERNESTINE.SMITH 0 0 1 2 0 0 0 ERNESTINE.SMITH 3  
6 203 Sun Dec 19 00:00:00 PST 1999 Sun Dec 26 00:00:00 PST 1999 0 0 0 0  
0 0 64.0 0.0 64.0
```

Ref.# 5002: One type of Deals file

~~# Stat Parties Exchange Fit Price & Terms When~~

```
### 1 Pending - 1 U 0 U 48 71 168.0 112.0 Fac0:K.DOLL-Fac1 1.0 0.0 - 0  
1 0 0 0 Sun Dec 19 00:00:00 PST 1999 Sun Dec 26 00:00:00 PST 1999 0 0 0  
1 K.JONES  
### 2 Pending - 1 U 0 U 52 73 112.0 168.0 Fac1:KENDRA.SCOTT-Fac0 1.0  
0.0 - 2 1 0 0 0 Sun Dec 19 00:00:00 PST 1999 Sun Dec 26 00:00:00 PST  
1999 39 239 1 0 KENDRA.BREAU
```

1000101005 - DELETED